

Chapter 5: Baseline Projections of New Facilities

INTRODUCTION

Facilities regulated under the §316(b) New Facility Rule are new greenfield manufacturing facilities and electric generators that operate a cooling water intake structure (CWIS), require a National Pollutant Discharge Elimination System (NPDES) permit, have a design intake flow of greater than two million gallons per day (MGD), and use at least 25 percent of their intake water for cooling purposes. The overall costs and economic impacts of the proposed rule depend on the number of new facilities subject to the rule, and on the proposed construction, design, location, and capacity of their CWISs.

This chapter presents forecasts of the number of new electric generators and manufacturing facilities subject to the proposed §316(b) New Facility Rule that will begin operating between 2001 and 2020. The chapter consists of three sections. The first section presents estimates of the number and characteristics of new electric generating facilities. The second section presents estimates of the number of new manufacturing facilities. Each section discusses uncertainties about the estimated number and type of facilities that will be constructed in the future. The third section summarizes the results of the new facilities forecasts.

5.1 NEW ELECTRIC GENERATORS

EPA used two data sources to estimate the number of new electric generators subject to the proposed §316(b) New Facility Rule: capacity forecasts from the Energy Information Administration's (EIA) *Annual Energy Outlook 2000* (AEO2000) and a database of planned new generating capacity (the *NEWGen database* created and maintained by RDI Consulting). The analysis involved two steps in estimating the number and characteristics of new generators for the first ten years (2001 to 2010) and for the second ten years (2011 to 2020) of the forecast period.

CHAPTER CONTENTS

5.1	New Electric Generators	5-1
5.1.1	Forecast for 2001 to 2010	5-1
5.1.2	Forecast for 2011 to 2020	5-6
5.1.3	Summary of Forecasts for New Electric Generators	5-7
5.1.4	Uncertainties and Limitations	5-7
5.2	New Manufacturing Facilities	5-7
5.2.1	Methodology	5-8
5.2.2	Projected Number of New Manufacturing Facilities	5-8
5.2.3	Uncertainties and Limitations	5-16
5.3	Summary of Baseline Projections	5-17
	References	5-18

5.1.1 Forecast for 2001 to 2010

EPA used the NEWGen database to identify specific new electric generators that would be affected by the proposed rule, based on their cooling water source and their CWIS location and characteristics. Since the NEWGen database only covers a portion of the 10-year forecasting period, EPA supplemented this facility-specific information with macro-level electric capacity forecasts from EIA's AEO2000.¹

a. NEWGen Sample Facilities

The NEWGen database is created and maintained by Resource Data International's (RDI) Energy Industry Consulting Practice. EPA used this database (beta version as of January 2000) to identify planned utility and nonutility electric generators that are subject to the proposed §316(b) New Facility Rule.

¹According to RDI, the lead time for permitting and construction of a new electric generating facility is approximately three years. Projects that might be constructed substantially beyond three years in the future are therefore not likely to be reflected in this data set. The NEWGen database alone therefore cannot provide a complete forecast of new electric generating facilities for the entire analysis period.

The database provides facility-level data on 466 electric generation projects, including new (greenfield) facilities and additions and modifications to existing facilities, proposed over the next several years. Information in the NEWGen database includes: generating technology, fuel type, generation capacity, owner and holding company, electric interconnection, project status, on-line dates, and other operational details. The majority of the information contained in this database is obtained from trade journals, developers, local authorities, siting boards, and state environmental agencies.

The 466 facilities contained in the NEWGen database include new facilities in Canada and Mexico and existing facilities in the U.S. These facilities are irrelevant to the proposed §316(b) New Facility Rule and were therefore excluded from the analysis. The Agency evaluated each of the remaining 331 facilities to assess whether they would be subject to the proposed rule, based on the following factors:

- ▶ **Project status:** EPA included only projects that are in “Early Development,” “Advanced Development,” or “Under Construction.” The analysis did not include projects that were listed as “Canceled” or “Tabled” because those projects are unlikely to be completed.
- ▶ **Date of initial commercial operation:** The rule only covers facilities that will begin commercial operation on or subsequent to the assumed promulgation date of August 13, 2001.² The analysis therefore excluded facilities with an operation date before August 13, 2001.
- ▶ **Facility type:** The analysis focuses on the subset of facilities that uses steam as a prime mover. Therefore, EPA included only those new facilities that will use steam electric generators (including steam turbine and combined-cycle prime movers).³ The analysis excluded facilities using internal combustion turbines, hydroelectric turbines, combustion turbines, and wind or solar technologies, because they generally do not require cooling water and will therefore not be subject to this proposed regulation.

²EPA also included facilities for which no date of commercial operation was reported.

³A combined-cycle prime mover is an electric generating technology in which electricity is produced from otherwise lost waste heat exiting from one or more gas (combustion) turbines.

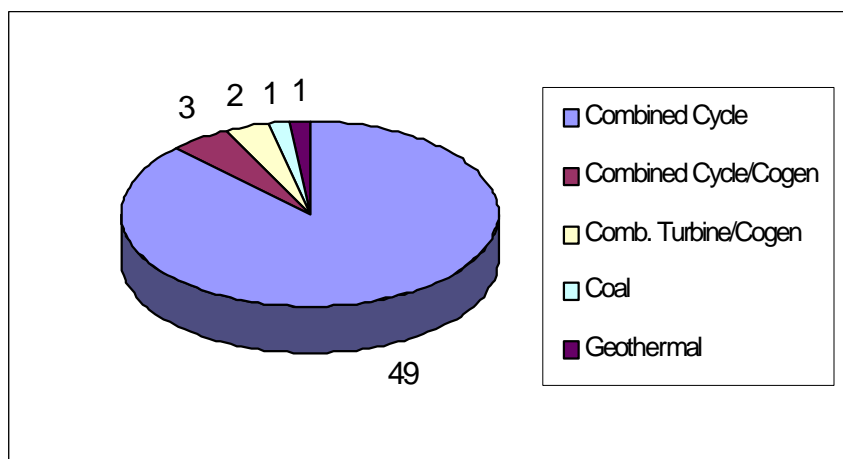
- ▶ **Availability of CWIS information:** EPA analyzed only those facilities that have filed sufficient information with their permitting authorities to determine their proposed cooling water source.⁴

A total of 56 facilities in the NEWGen database met these criteria. The following discussion refers to this subset of 56 facilities as the “NEWGen sample facilities.”

The steam electric facilities in the NEWGen database reflect a strong trend toward combined-cycle generation technologies. Figure 5-1 shows that the large majority of the new facilities, 88 percent, are proposed with a combined-cycle prime mover. This trend is of significance to the proposed §316(b) New Facility Rule because combined-cycle technologies require less cooling water per unit of output than do other steam electric generating technologies. Analyses show that a combined-cycle facility uses approximately one third of the cooling water compared to a facility of the same size using steam turbines. Combined-cycle/cogeneration facilities are the second most common type of new facility in the NEWGen sample, representing approximately five percent of the new steam electric facilities.⁵ Two facilities are planned with a combustion turbine/cogeneration technology. Only one coal facility and one geothermal facility are among the 56 sample facilities. The 56 sample facilities account for over 40,000 megawatts (MW) of new capacity. The combined-cycle facilities represent over 91 percent of these new capacity additions, the three combined-cycle/cogeneration facilities account for approximately five percent of the sample facility capacity, and the other three facility types represent less than three percent each of the sample facility capacity.

⁴Information on a facility’s permitting status and proposed cooling water source was obtained from state permitting authorities. Facilities for which cooling water source information is not available will not be disregarded when determining overall impacts from the proposed rule. The extrapolation methodology presented in subsection 5.1.1.c accounts for these facilities by including sufficient new facilities to account for the total projected growth in steam electric generating capacity.

⁵Cogeneration is the combined production of electricity and another form of useful thermal energy (such as heat or steam) which is used for industrial, commercial, heating, or cooling purposes.

Figure 5-1: Number of NEWGen Sample Facilities by Facility Type

Source: RDI, 2000.

b. Regulated Facilities in the NEWGen Sample

Not all 56 new steam electric facilities identified from the NEWGen database will be subject to the rule. EPA obtained information on the CWIS characteristics of the 56 electric generators, to determine the number of new facilities that would fall within the scope of the regulation. Facilities subject to the proposed rule must:

- ▶ withdraw from a water of the United States through a new CWIS;
- ▶ hold or require an NPDES permit;
- ▶ have a design intake flow of more than two million gallons per day (MGD); and
- ▶ use at least 25 percent of the total intake flow for cooling purposes.

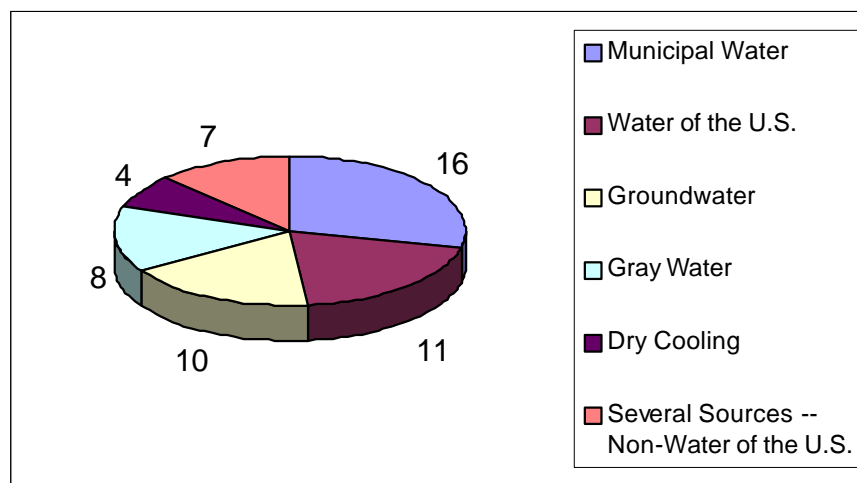
An analysis of permit applications for the 56 sample facilities showed that only seven of the 56 facilities meet all of these criteria, and thus fall within the scope of the proposed §316(b) New Facility Rule. Table 5-1 indicates why 49 of the 56 NEWGen sample facilities are not in scope and hence will not incur any regulatory costs.

Table 5-1: In Scope Status of NEWGen Sample Facilities

In Scope Status	Number of Facilities	Percent of Sample Facilities
In Scope	7	12.5%
Out of Scope	49	87.5%
<i>Does not withdraw from waters of the U.S.</i>	45	80.4%
<i>Existing CWIS</i>	3	5.4%
<i>No NPDES permit</i>	1	1.8%
<i>Design intake flow less than 2 MGD</i>	0	0.0%
<i>Less than 25% of intake water used for cooling purposes</i>	0	0.0%

Source: EPA analysis of information from state permitting authorities, 2000.

The majority of the sample facilities (80 percent) fall outside the scope of the proposed rule because they do not withdraw from a water of the U.S. As shown in Figure 5-2, municipal water, groundwater, and gray water (treated effluent from sewage systems) are the most common alternative sources of cooling water. Four of the 56 new facilities are planning to use a dry cooling system.

Figure 5-2: Number of NEWGen Sample Facilities by Cooling Water Source

Source: EPA analysis of information from state permitting authorities, 2000.

Table 5-2 describes the operational characteristics of the seven in scope sample facilities.

Table 5-2: Operational Characteristics of In Scope NEWGen Sample Facilities

Facility Name	NERC Region	Facility Type	Fuel Source	Capacity (MW)	Projected On-Line Date
GenA	NPCC	CC	Natural Gas	750	2002
GenB	MAIN	CC	Natural Gas	1,100	2001 -2003
GenC	ERCOT	CC	Natural Gas	510	2001 - 2003
GenD	NPCC	CC	Natural Gas	525	2001
GenE	NPCC	CT/Cogen	Natural Gas	475	2002
GenF	NPCC	CC	Natural Gas	544	2001
GenG [†]	SERC	CC/Cogen	Natural Gas	650	2002
		CT	Natural Gas	150	2002

[†] GenG is proposing to begin operation of its units in two phases.

Source: RDI, 2000.

The majority of the in scope facilities are concentrated in the Northeast: four of the seven facilities, or 57 percent, will be built in the Northeast Power Coordinating Council (NPCC). The remaining three facilities will be located in three different regions: the Mid-America Interconnect Network (MAIN), the Electric Reliability Council of Texas

(ERCOT), and the Southeastern Electric Reliability Council (SERC).

The seven in scope facilities range in capacity from 475 to 1,100 MW. All seven will use natural gas as their primary fuel source. Five facilities (GenA, GenB, GenC, GenD, and

GenF) plan on using combined-cycle (CC) technologies to generate electricity. GenE will use a combined-cycle/cogeneration technology, and GenG plans to use two units, one combined-cycle/cogeneration unit and one smaller combustion turbine.

c. Extrapolation of NEWGen Data to 10 Years

The NEWGen database only covers a portion of the 10-year forecasting period. EPA therefore used the U.S. Department of Energy capacity forecast described in EIA's AEO2000 to estimate the total number of new facilities for the period between 2001 and 2010. EIA's National Energy Modeling System (NEMS) projects future market conditions using a range of assumptions about overall economic growth, global fuel prices, and legislation and regulation affecting energy markets. NEMS forecasts are based on modeled equilibrium of supply and demand for electricity (EIA, 1999b).

The NEMS "Reference Case" forecasts for steam electric capacity provided the basis for estimating the number of new steam electric generating facilities constructed over the

next ten years. The total number of new steam electric facilities is calculated by dividing the projected capacity, 73,591 MW, by the average capacity of the 56 NEWGen facilities, 723 MW.⁶ Based on this methodology, EPA estimates that a total of 102 new steam electric facilities will be constructed over the next 10 years. Assuming that the proportion of these 102 facilities that will be in scope of this regulation is the same as for the NEWGen 56 facilities results in a forecast of 13 new in scope facilities (Table 5-3). This approach assumes that all new projected steam electric capacity will come from new greenfield facilities and may overestimate the number of new electric generators potentially affected by this rule, since some of the capacity growth may come from expansions or repowering of existing facilities.

⁶Steam electric capacity additions include planned and unplanned additions of coal steam and combined-cycle. EIA does not project any additions from nuclear power or other fossil steam (including oil-, gas-, and dual-fired capacity) over the next 20 years (AEO, 2000).

Table 5-3: Projection of New and Affected Electric Generators over 10 Years		
	Sample Facilities (NEWGen)	10-Year Projection
Number of Facilities	56	102
Number of In Scope Facilities Incurring Compliance Costs	7	13 [†]

[†] (7/56 * 102)

Source: EPA analysis based on RDI, NEWGen Database, January 2000; AEO 2000.

The electric power industry is currently experiencing a rapid expansion due the transition from a highly regulated monopolistic industry to a more competitive industry. This expansion has contributed to a surge in the number of generating plants being planned or under construction. As discussed earlier, only steam electric facilities use substantial amounts of cooling water and were considered for this analysis. The NEWGen sample data for new steam electric facilities show a trend toward combined-cycle generating technologies. This trend may reflect the transition toward competitive pricing for electricity. In competitive markets, prices will reflect the interaction of supply and demand for electricity. During most time periods, the price of electricity will be set by the generating unit with the highest operating costs needed to meet spot market generation demand (i.e., the “marginal cost” of production). The lower capital and operating cost usually associated with gas generation technologies may be one reason for the trend toward combined-cycle generating units in new facilities.

The NEWGen sample data also show a trend away from the use of a water of the U.S. as cooling water. Table 5-1 shows that 80 percent of the sample facilities use alternative sources of cooling water. EPA believes this trend reflects the increased competition for water and an increasing awareness of the need for water conservation.

Taken together, the trend toward combined-cycle generating technologies, which have small cooling water requirements per unit of output, and the trend away from the use of waters of the U.S. as cooling water result in a low projected number of regulated facilities, despite the expected expansion in new generating capacity.

5.1.2 Forecast for 2011 to 2020

For the second 10 years of the analysis, 2011 to 2020, no facility-specific information on new electric generators and their CWIS characteristics is available. EPA therefore relied on EIA’s capacity forecasts in the AEO2000 and assumptions about the size, location, and operational

characteristics of facilities projected to begin operation between 2011 and 2020.

The AEO2000 forecasts additions of 17,190 MW of coal steam capacity and 61,584 MW of combined-cycle capacity between 2011 and 2020. No new capacity additions are expected for other types of steam electric power, including nuclear power and other fossil steam. EPA made the following assumptions about the number of new facilities that will provide this additional capacity and their projected in scope status with respect to this proposed rule:

Coal steam capacity

- 82 percent of projected capacity additions will come from new facilities;⁷ 18 percent will come from repowering or additions to existing facilities which are not covered under this proposed rule. Of the 17,190 MW of coal steam capacity additions, new facilities will therefore account for approximately 14,100 MW.
- New coal steam facilities will have a generating capacity of 800 MW. Eighteen new coal-fired facilities of 800 MW each will be required to provide the 14,100 MW of new capacity.
- Ten percent of new coal steam facilities will not be in scope of this regulation. This assumption results in a total of 16 new coal facilities that are expected to begin operation between 2011 and 2020 and be subject to this regulation.

Combined-cycle capacity

- New facilities will account for all combined-cycle capacity additions projected to come on-line between 2011 and 2020.

⁷This estimate is based on the share of coal capacity additions from new facilities reported in the NEWGen database.

- ▶ The average size of a new combined-cycle facility is the same as the average size of the 56 sample NEWGen facilities, i.e., 723 MW. Eighty-five facilities of 723 MW each will be required to provide the forecasted 61,584 MW of additional combined-cycle capacity.
- ▶ The in scope rate of new combined-cycle facilities is the same as that of the 56 NEWGen facilities, 12.5 percent. Based on this assumption, a total of 11 new combined-cycle facilities are expected to begin operation between 2011 and 2020 and be subject to this regulation

5.1.3 Summary of Forecasts for New Electric Generators

EPA estimates that a total of 205 new steam electric generators will begin operation between 2001 and 2020. 102 new facilities are expected to begin operation in the first ten years and 103 in the second ten years. Of the total number of new plants, EPA projects that 40 will be in scope of the proposed §316(b) New Facility Rule. Sixteen are expected to be coal-fired facilities and 24 combined-cycle facilities.

Table 5-4 summarizes the results of the analysis.

Table 5-4: Number of Projected New Electric Generators (2001 to 2020)						
Year of Initial Operation	Total Number of New Facilities			Facilities In Scope of the Proposed Rule		
	Coal	Combined-Cycle	Total	Coal	Combined-Cycle	Total
2001 - 2010	0	102	102	0	13	13
2011 - 2020	18	85	103	16	11	27
Total	18	187	205	16	24	40

Source: EPA Analysis, 2000.

5.1.4 Uncertainties and Limitations

There are substantial uncertainties in EPA's projections of the number of new electric generators that will be subject to the proposed §316(b) New Facility Rule. EPA used two main data sources to derive the estimates: RDI's NEWGen database and EIA's AEO2000. While EPA has a high degree of confidence in the projection of total new steam electric capacity over the next ten years, there is more uncertainty about the number of new facilities over the second ten years. In addition, there is uncertainty about the portion of new capacity that will be provided by new in scope facilities. The projected number of new facilities for 2001 to 2010 assumes that the mix in new generating capacity over the next ten years will be identical to the mix planned over the next few years, as reflected in the NEWGen database. This assumption is realistic only if there are no significant changes in the relative efficiency and cost of constructing and employing the various steam electric generating technologies.

In addition, the electric power industry is in the middle of a major restructuring as the result of industry deregulation. While predictions about economic and technological trends 20 years into the future are always challenging, this is particularly the case for an industry undergoing substantial structural changes.

EPA believes that the trend toward closed-cycle cooling and the use of alternative cooling water sources, as observed in the NEWGen sample data, stems from an increasing consciousness in many parts of the country of the value of aquatic resources and the need to conserve water. As a result, EPA expects that the characteristics observed in the NEWGen database are not short-term phenomena that are tied to economic conditions but represent developments that are likely to continue beyond the current business cycle. The Agency therefore believes that the projected aggregate number of new in scope facilities is realistic, although there are uncertainties about specific characteristics of the new facilities.

5.2 NEW MANUFACTURING FACILITIES

Data on industrial water use presented in Chapter 2 showed that the Paper and Allied Products (SIC 26), Chemicals and Allied Products (SIC 28), Petroleum and Coal Products (SIC 29), and Primary Metals (SIC 33) industries account for more than the 90 percent of the water used for cooling purposes in the manufacturing sector. The economic analysis for manufacturing facilities therefore focuses on these industries. Other industrial sectors draw relatively small volumes of water for cooling purposes, and it is

unlikely that significant numbers of facilities in these industries will exceed the two MGD threshold. The forecasts of new in scope facilities presented in this section cover the same 20-year time frame used for the projections of electric generation facilities.

5.2.1 Methodology

Forecasts of the number of new greenfield facilities that will be built in the various industrial sectors are generally not available over the 20-year time period required for this analysis. Information on the likely design and location characteristics of new facilities that will determine their status under the proposed rule is also not generally available for planned manufacturing facilities. EPA therefore estimated the number of new facilities based on general industry growth forecasts and other information for each industry, and used information on the characteristics of existing facilities in each industry to project the portion of these new facilities that will be subject to the proposed rule.

Information on existing facilities from the §316(b) *Industry Screener Questionnaire* provided a starting point for the forecast. The screener questionnaire results include information on the number and characteristics of existing facilities in the four industry sectors of interest. The Agency reviewed these facilities to determine how many of the screener facilities in each industry have NPDES permits, use CWISs that draw from a water of the U.S., have an intake flow of more than two MGD, and use at least 25 percent of that flow for cooling purposes.

Projected growth rates for value of shipments in each industry were used to project future growth in capacity. A number of sources provide forecasts, including the annual *U.S. Industry Trade & Industry Outlook*, USGS industry profiles for metals industries, and other sources specific to each industry.⁸ EPA assumed that the growth in capacity will equal growth in the value of shipments, except where industry-specific information supported alternative assumptions. This assumption will overstate the growth in capacity to the extent that some growth in shipments will be provided by underutilized existing capacity. Some of the projected growth in capacity may also result from increasing efficiency or expansions in capacity at existing facilities rather than building new facilities. Information from industry sources provided a basis for estimating the potential for construction of new greenfield facilities for some industries. In other cases, EPA assumed as a default that 50 percent of the projected growth in capacity will be attributed to new greenfield facilities.

EPA also assumed that new greenfield plants will be the

same size on average as the existing screener plants in the same industry. Therefore, the projected capacity growth rate multiplied by the percentage of capacity growth that is expected to come from new facilities is applied to the number of screener plants in each industry to calculate the total number of new plants.

Not all of the projected new facilities will be subject to requirements under the proposed rule. EPA assumed that the characteristics of new facilities will be similar to the characteristics of existing screener facilities (i.e., the same proportion of new as existing facilities would have NPDES permits, would draw cooling water from a water of the U.S., and would have specific intake volumes and types of CWIS). Therefore, the number of new in scope facilities is calculated by applying the percentage of screener facilities that have NPDES permits, draw from a water of the U.S., have an intake flow of more than two MGD, and use 25 percent of intake flow for cooling purposes to the total number of projected new plants. This approach most likely overstates the number of new facilities that will incur regulatory costs, because new facilities may be more likely than existing ones to recycle water and use cooling water sources other than a water of the U.S.

Section 5.2.2 below presents EPA's projection of the number of new facilities over the first *ten* years of the rule (2001 to 2010). EPA made the simplifying assumption that the same number of facilities would begin operation during the second ten years (2011 to 2020), and that these facilities would have characteristics similar to the facilities that will begin operation during the first ten years.⁹

5.2.2 Projected Number of New Manufacturing Facilities

a. Paper and Allied Products (SIC 26)

The §316(b) Industry Screener Questionnaire identified four 4-digit SIC codes in the Paper and Allied Products Industry (SIC 26) which are likely to be relevant to the proposed rule:

2611	–	Pulp Mills
2621	–	Paper Mills
2631	–	Paperboard Mills
2676	–	Sanitary Paper Products

EPA analyzed these industry segments to estimate the number of new in scope facilities in the Paper and Allied Products Industry.

⁸A complete list of data sources used can be found in the References at the end of this chapter.

⁹The Summary of Baseline Projections presented in Section 5.3 shows the estimated number of new facilities for the entire forecasting period.

❖ *Projected growth in shipments*

Shipments of pulp and paper products are closely tied to the overall state of the U.S. and world economies (McGraw-Hill, 1999). Product exports are expected to increase as barriers to foreign market access are reduced through the North American Free Trade Agreement (NAFTA) and the General Agreement on Tariffs and Trade (GATT) (Stanley, 2000). Industry sources project the following growth rates for different segments of the market (Stanley, 2000):

- ▶ Pulp mill shipments (SIC 2611) are expected to increase by 1.75 percent annually over the 5-year period 2000 through 2004, with most of the growth representing increased exports.
- ▶ Shipments from the paper and paperboard mills sector (SICs 2621, 2631) are expected to increase about 1.8 percent annually from 2000 through 2004.
- ▶ No specific forecasts for sanitary paper products (SIC 2676) are available. EPA therefore assumed that between 1999 and 2003 shipments from these facilities will grow at the same rate as the overall U.S. GDP, or 2.5 percent annually (U.S. DOE, 2000).

❖ *Projected number of new facilities*

Most sectors of the paper industry have been consolidating, with slower growth in capacity than in the past. According to the S&P Paper and Forest Products Industry Survey (S&P, 1999a), most companies that have increased operating capacity in recent years have taken over existing mills rather than constructing new mills. Those firms which cannot find a merger partner or an acquirable mill are often modernizing existing facilities rather than constructing a major new facility.

New capacity additions in 1999 in the pulp and paper industry were at their lowest level in the past 10 years, and the same is expected for 2000. According to the 40th annual Capacity Survey by the American Forest & Paper Association (AF&PA), U.S. capacity to produce paper and paperboard will increase by an annual average of 0.9 percent over the period 1999 to 2001 (pponline.com, 1999). This represents the lowest level of extended capacity additions in almost 40 years. The AF&PA survey cites several factors to explain the slow growth in capacity, including a highly competitive trade environment for some grades, competing demands for the industry's capital, and mill and machine shutdowns. Although most conditions influencing the industry are conducive to some growth, certain grades are experiencing reduced demand. Several pulp mills closed during the second half of 1998, and additional market pulp capacity was closed during 1999. According the AF&PA survey, 577,000 tons of paper and paperboard capacity was

removed in 1998 and 2.5 million tons in 1999, mostly in the containerboard grades. Standard and Poor's (S&P) estimates that 6 percent of U.S. containerboard capacity was shut down between late 1998 and early 1999 (S&P, 1999). The recent reduced investment in new capacity is likely to continue. Any growth in production in the pulp, paper, and paperboard mill sectors (SICs 2611, 2621, and 2631) will likely result from increased efficiency at existing facilities, reopening of capacity that is currently idle, or perhaps rebuilding or expanding existing facilities (Stanley, 2000; Jensen, 2000). Therefore, EPA assumed that none of the projected growth in these industries would result from new greenfield facilities.

Substantial growth has occurred in the secondary fiber deink sector since 1990. The number of deink facilities has grown from 43 (1990) to about 77 over the past ten years. The sanitary paper products sector (SIC 2676) potentially includes deink facilities and may therefore experience construction of new greenfield facilities. EPA does not expect these new deink facilities to be in scope, however, because evidence suggests that cooling water intake flows of stand-alone deink facilities are well below the 2 MGD minimum flow threshold of the proposed §316(b) New Facility Rule (Environmental Assessment for Wisconsin Tissues, Weldon, N.C.). The existing facilities in SIC 2676 identified in the screener questionnaire all have intake flows substantially above two MGD, and are therefore likely to be in the non-deink part of SIC 2676. No growth is projected for new non-deink facilities in SIC 2676.

Table 5-5 presents the number of existing facilities in the four analyzed SIC codes and the projected industry growth (both the annual growth rate and the compounded growth rate over ten years) but shows that none of the growth in SIC 26 is expected to result from new facilities.

Table 5-5: Projected Number of New Pulp and Paper Facilities (SIC 26)

SIC	Number of Existing Facilities ¹		Projected Industry Growth			Estimated Number of New Facilities	
	Total Screener Facilities (1998)	With CWIS, NPDES Permit, Flow > 2 MGD, and 25% for Cooling	Annual	Over 10 Years ²	Share of Growth from New Facilities	Total ³	In Scope ⁴
2611	66.1	43.2	1.75%	18.94%	0.0%	0	0
2621	285.5	127.5	1.80%	19.53%	0.0%	0	0
2631	185.9	44.8	1.80%	19.53%	0.0%	0	0
2676 ⁵	3.8	3.8	2.50%	28.01%	0.0%	0	0
Total	541	219				0	0

¹ From screener survey results.

² Total percentage growth over 10 years, based on the forecasted annual growth rate $[(1 + \text{annual rate})^{10} - 1]$.

³ Equal to total number of screener facilities * $(1 + 10\text{-year growth rate})$ * share of growth from new facilities.

⁴ Equal to estimated total number of new facilities * ratio of number of screener facilities with CWIS, NPDES permit, flow > 2 MGD, and at least 25% use for cooling to the total number of screener facilities.

⁵ Screener respondents in this SIC code are assumed to be facilities other than deink facilities.

Source: §316(b) Industry Screener Questionnaire and various industry sources.

b. Chemicals Manufacturing (SIC 28)

The §316(b) Industry Screener Questionnaire identified sixteen 4-digit SIC codes in the Chemicals Manufacturing Industry (SIC 28) that include facilities with NPDES permits, that use a CWIS, draw from a water of the U.S., and use at least 25 percent of the intake for cooling purposes:

2812	–	Alkalies and Chlorine
2813	–	Industrial Gases
2616	–	Inorganic Pigments
2819	–	Industrial Inorganic Chemicals, NEC
2821	–	Plastics Material and Synthetic Resins, and Nonvulcanizable Elastomers
2823	–	Cellulosic Manmade Fibers
2824	–	Manmade Organic Fibers, Except Cellulosic
2833	–	Medicinal Chemicals and Botanical Products
2834	–	Pharmaceutical Preparations
2841	–	Soaps and Other Detergents, Except Speciality Cleaners
2865	–	Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments
2869	–	Industrial Organic Chemicals, NEC
2873	–	Nitrogenous Fertilizers
2874	–	Phosphatic Fertilizers
2892	–	Explosives
2899	–	Chemicals and Chemical Preparations, NEC

EPA analyzed each of these sixteen industry segments to estimate the number of new in scope facilities in the Chemicals Manufacturing Industry.

❖ Projected growth in shipments

The Kline *Guide to the U.S. Chemical Industry* projects that shipments of the products from the chemical industry will generally follow the pattern of overall industrial growth over the next decade (Kline, 1999). The Chemical Manufacturers Association (CMA) reported that most chemical companies have been experiencing tough competition, with strong downward pressure on pricing, the loss of some export markets, and growing over-capacity. In response to an uncertain outlook for global chemical demand, firms are accelerating the pace of restructuring, joint venture, de-merger, and merger. Industry consolidation, competition, and continuing globalization has led to high capacity in many products and generally lower profitability than in the past (S&P, 2000). Industry employment will decline slightly during the next few years as a result of continued downsizing and outsourcing efforts. Some of the uncertainties facing the U.S. chemical industry include rising oil prices and global over-capacity in petrochemicals (Swift, 1999). More specifically, industry sources project the following growth rates for value of shipments in different chemicals market segments (Kline, 1999, except where noted):

- ▶ Shipments of industrial gases (SIC 2813) are projected to grow at a rate of 2.8 percent annually through 2003, while the rest of the inorganic chemicals sector (SIC 281) will grow at a rate of 1.9 percent annually.
 - ▶ Shipments in the plastics industry (SIC 2821) are forecasted to grow more than 4 percent annually through 2003 (McGraw-Hill, 1999; Kline, 1999).
 - ▶ Man-made fibers production (SICs 2823 and 2824) is expected to grow 1.9 percent annually through 2000. EPA assumed that this trend will continue in the near future.
 - ▶ Medicinal chemicals shipments (SIC 2833) are expected to grow by 2.8 percent per year through 2003. The growth will be fueled by new products and increased demand for pharmaceuticals (McGraw-Hill, 1999). Growth in shipments of U.S. pharmaceutical products (SIC 2834) are projected to average “in the mid-single digits” for five years (McGraw-Hill, 1999). EPA assumed an annual growth rate of 5 percent for SIC 2834.
 - ▶ Shipments of soaps and detergents (SIC 2841) are projected to increase by 2.4 percent per year through 2003.
 - ▶ Basic petrochemical shipments (SIC 2865) are expected to grow by 3.3 annually through 2003 (Kline, 1999). There have been supply shortages for the largest volume organic chemical (ethylene), and capacity is expected to expand over the next year to ease the tightness in supply. Two facilities in Texas, each with annual capacity of about 1.8 billion pounds of ethylene, are expected to be completed by late 2000 (S&P, 2000).
 - ▶ Shipments of industrial organic chemicals not elsewhere classified (SIC 2869) are projected to increase by 3 percent annually through 2003 (McGraw-Hill, 1999).
 - ▶ Shipments of fertilizers are projected to increase by 2.4 percent annually through 2003 (Kline, 1999). The fertilizer industry (SICs 2873 and 2874) reflects a modest projected growth in the underlying American farm economy. The industry has undergone significant consolidation in recent years (McGraw-Hill, 1999).
 - ▶ Shipments of explosives (SIC 2892) are expected to grow 4.1 percent per year.
 - ▶ Shipments of miscellaneous chemicals (SIC 2899) are expected to increase by 3 percent annually through 2003 (McGraw-Hill, 1999).
- ❖ *Projected number of new facilities*
- EPA estimates that 284 new facilities may be constructed over the next ten years in the relevant SIC 28 segments, as shown in Table 5-6. Of these, 24 are expected to be in scope of the proposed §316(b) New Facility Rule. Nine of the in scope facilities are expected to produce industrial organics (SIC 2869), and three are plastics manufacturing facilities (SIC 2821).

Table 5-6: Projected Number of New Chemical Manufacturing Facilities (SIC 28)

SIC	Number of Existing Facilities ¹		Projected Industry Growth			Estimated Number of New Facilities	
	Total Screener Facilities (1998)	With CWIS, NPDES Permit, Flow > 2 MGD, and 25% for Cooling	Annual	Over 10 Years ²	Share of Growth from New Facilities	Total ³	In Scope ⁴
2812	28.1	9.7	1.9%	20.7%	50.0%	3	1
2813	109.8	4.1	2.8%	31.8%	50.0%	17	1
2816	25.3	4.1	1.9%	20.7%	50.0%	3	0
2819	270.8	16.7	1.9%	20.7%	50.0%	28	2
2821	305.1	14.5	4.0%	48.0%	50.0%	73	3
2823	6.7	2.2	1.9%	20.7%	50.0%	1	0
2824	31.3	6.3	1.9%	20.7%	50.0%	3	1
2833	33.3	3.4	2.8%	31.8%	50.0%	5	1
2834	91.4	4.1	5.0%	62.9%	50.0%	29	1
2841	35.9	4.1	2.4%	26.8%	50.0%	5	1
2865	59.3	5.2	3.3%	38.4%	50.0%	11	1
2869	367.9	52.6	3.0%	34.4%	50.0%	63	9
2873	59.7	8.2	2.4%	26.8%	50.0%	8	1
2874	37.8	4.5	2.4%	26.8%	50.0%	5	1
2892	9.7	1.1	4.1%	49.5%	50.0%	2	0
2899	163.1	5.2	3.0%	34.4%	50.0%	28	1
Total	1,635	146				284	24

¹ From screener survey results.² Total percentage growth over 10 years, based on the forecasted annual growth rate $[(1 + \text{annual rate})^{10} - 1]$.³ Equal to total number of screener facilities * $(1 + 10\text{-year growth rate})$ * share of growth from new facilities.⁴ Equal to estimated total number of new facilities * ratio of number of screener facilities with CWIS, NPDES permit, flow > 2 MGD, and at least 25% use for cooling to the total number of screener facilities.

Source: §316(b) Industry Screener Questionnaire and various industry sources.

c. Petroleum and Coal Products (SIC 29)

Responses to the industry screener survey indicate that two Petroleum and Coal Product sectors, SIC 2911 – Petroleum Refining; and SIC 2999 – Products of Petroleum and Coal, Not Elsewhere Classified, are likely to be relevant to the proposed regulation. These two industry segments are analyzed to determine the number of new in scope facilities in the Petroleum and Coal Products Industry.

❖ Projected growth in shipments

EIA forecasts that U.S. petroleum consumption will increase by 6.2 million barrels (bbl) a day between 1998 and 2020. More than 90 percent of the projected demand growth results from increased consumption of “light products,” including gasoline, diesel, heating oil, jet fuel, and liquified petroleum gases. Expansions at existing refineries (SIC 2911) are expected to meet only half of the projected increase in demand. The remainder is expected to result from increased imports of petroleum product (U.S. DOE, 1999a).

No forecasts of shipments specific to Miscellaneous Products of Coal and Petroleum (SIC 299) are available. Therefore, EPA assumed that shipments from this industry will grow at the same 2.5 percent annual rate as forecast for overall GDP.

❖ Projected number of new facilities

EIA projects that domestic refinery capacity (SIC 2911) will grow from 16.3 million bbl per day in 1998 to between 17.6 million bbl per day (low economic growth case) and 18.3 million bbl per day (high economic growth case) in 2020. This expansion will result from expanded capacity at existing refineries. No new refineries are likely to be constructed in the U.S. due to financial and legal constraints (U.S. DOE, 1999a). For the purpose of this analysis, EPA therefore assumed that there will be no new petroleum refineries constructed in the U.S. over the next 10 years.

No information on expected capacity growth specific to SIC 2999 was identified. EPA therefore assumed that one-half of the projected growth in shipments will result from new facilities in these industries. Table 5-7 shows that one new facility is expected in SIC 2999. However, given the low numbers of screener facilities with in scope characteristics in that industry sector, EPA’s forecast methodology results in a projection that no new in scope facilities will be constructed in SIC code 2999 over the next 10 years.

Table 5-7: Projected Number of New Petroleum and Coal Products Facilities (SIC 29)

SIC	Number of Existing Facilities ¹		Projected Industry Growth			Estimated Number of New Facilities	
	Total Screener Facilities (1998)	With CWIS, NPDES Permit, Flow > 2 MGD, and 25% for Cooling	Annual	Over 10 Years ²	Share of Growth from New Facilities	Total ³	In Scope ⁴
2911	162.8	27.9	2.5%	28.0%	0.0%	0	0
2999	7.8	1.1	2.5%	28.0%	50.0%	1	0
Total	171	29				1	0

¹ From screener survey results.

² Total percentage growth over 10 years, based on the forecasted annual growth rate $[(1 + \text{annual rate})^{10} - 1]$.

³ Equal to total number of screener facilities * $(1 + 10\text{-year growth rate})$ * share of growth from new facilities.

⁴ Equal to estimated total number of new facilities * ratio of number of screener facilities with CWIS, NPDES permit, flow > 2 MGD, and at least 25% use for cooling to the total number of screener facilities.

Source: §316(b) Industry Screener Questionnaire and various industry sources.

d. Steel (SIC 331)

The §316(b) Industry Screener Questionnaire identified five 4-digit SIC codes in the Steel Industry (SIC 331) that are most likely to be most relevant to the proposed §316(b) New Facility Rule:

- 3312 – Steel Works, Blast Furnaces (Including Coke Ovens), and Rolling Mills
- 3313 – Electrometallurgical Products, Except Steel
- 3315 – Steel Wiredrawing and Steel Nails and Spikes
- 3316 – Cold-Rolled Steel Sheet, Strip, and Bars
- 3317 – Steel Pipe and Tubes

EPA analyzed each of these five industry segments to determine the number of new in scope facilities in the Steel Industry.

❖ *Projected growth in shipments*

Demand for North American steel is expected to increase over the long term. Domestic demand for steel mill products, which dropped precipitously during the 1980's, rebounded sharply during the 1990's. This increase in demand is attributed to overall growth in steel-consuming

industries and increased steel use in some areas such as construction. The U.S. steel industry is considerably smaller, internationally competitive, and more innovative, after a decade of restructuring in the 1990's (McGraw-Hill, 1999). Steel shipments are expected to rise at a 1 to 2 percent annual rate through 2003, assuming continued moderate economic growth (McGraw-Hill, 1999).

❖ *Projected number of new facilities*

Recent growth in new steelmaking capacity has been in minimills. The success of the thin slab caster/flat rolling mill has resulted in construction of as much as 11 million tons of new minimill steel capacity in the U.S. between 1997 and 2000. Table 5-8 provides information on six new EAF minimill projects planned between late 1998 and early 2001. Higher demand is expected to absorb some of the new capacity from these mills. Imports are also likely to be displaced and exports will increase (McGraw-Hill, 1998). While new low-cost minimills have been starting up, some antiquated, less efficient integrated mills have been shut down and other integrated producers have increased output efficiencies at their existing blast furnaces (McGraw-Hill, 1999).

Table 5-8: Major New Minimill Projects 1998-2001

Company	Project	Location	Completion	Cost
Nucor	Structural mill	Berkeley County, S.C.	Late 1998	\$150 million
Nucor	Cold mill	Hickman, AR	Early 1999	\$120 million
Chapparral	Structural mill	Dinwiddie County, VA	Mid-1999	\$400 million
Nucor	Plate mill	Hertford County, NC	Early 2000	\$300 million
Steel Dynamics	Structural mill	Whitley County, IN	Early 2000	\$285 million
Ipsco	Plate mill	Mobile County, AL	Early 2001	\$425 million

Source: *Metal Center News Online, 2000.*

EPA assumed that one-half of the projected growth in shipments in all potentially-affected steel industries will result from new facilities, and that all of the new facilities in the basic steel sector (SIC 3312) will be new minimills rather than new integrated facilities. Table 5-9 shows the

projected number of new in scope facilities in this sector. EPA estimates that 39 new facilities will be constructed over the next 10 years, of which four will be in scope of the proposed §316(b) New Facility Rule.

Table 5-9: Projected Number of New Iron and Steel Facilities (SIC 331)

SIC	Number of Existing Facilities ¹		Projected Industry Growth			Estimated Number of New Facilities	
	Total Screener Facilities (1998)	With CWIS, NPDES Permit, Flow > 2 MGD, and 25% for Cooling	Annual	Over 10 Years ²	Share of Growth from New Facilities	Total ³	In Scope ⁴
3312 ⁵	156.6	37.7	1.5%	16.1%	50.0%	13	3
3313	5.6	1.1	2.5%	28.0%	50.0%	1	0
3315	121.9	3.1	1.5%	16.1%	50.0%	10	0
3316	59.8	9.3	1.5%	16.1%	50.0%	5	1
3317	129.6	1.1	1.5%	16.1%	50.0%	10	0
Total	474	52				39	4

¹ From screener survey results.

² Total percentage growth over 10 years, based on the forecasted annual growth rate $[(1 + \text{annual rate})^{10} - 1]$.

³ Equal to total number of screener facilities * $(1 + 10\text{-year growth rate})$ * share of growth from new facilities.

⁴ Equal to estimated total number of new facilities * ratio of number of screener facilities with CWIS, NPDES permit, flow > 2 MGD, and at least 25% use for cooling to the total number of screener facilities. All new facilities in SIC 3312 are assumed to be minimills rather than integrated steel mills.

Source: §316(b) Industry Screener Questionnaire and various industry sources.

e. Aluminum and Other Nonferrous Metals (SICs 333, 335)

The §316(b) Industry Screener Questionnaire identified three 4-digit SIC codes in the Aluminum and Other Nonferrous Metals Industry (SICs 333 and 335) that are potentially relevant to the proposed §316(b) New Facility Rule:

- 3334 – Primary Production of Aluminum
- 3339 – Primary Smelting and Refining of Nonferrous Metals, Except Copper and Aluminum
- 3353 – Aluminum Sheet, Plate, and Foil

EPA analyzed each of these three industry segments to determine the number of new in scope facilities in the Aluminum and Other Nonferrous Metals Industry.

❖ Projected growth in shipments

Total shipments for all sectors of the aluminum industry are expected to increase 3 percent annually from 1999 through 2003 (McGraw-Hill, 1999). EPA therefore assumed that shipments of primary aluminum smelters (SIC 3334) and aluminum sheet, plate, and foil (SIC 3353) will increase at an annual rate of 3 percent. No information is available on the specific products produced by the screener facilities in SIC code 3339. EPA therefore assumed that shipments for this industry sector will grow at the same rate as overall

GDP (2.5 percent annually).

❖ Projected number of new facilities

There is a substantial amount of idled aluminum capacity in the U.S. that could be brought on-line as demand improves (McGraw-Hill, 1999). This idle capacity is likely to limit construction of new capacity and to limit price increases for aluminum (S&P, 2000). The 1997 capacity utilization rate of 86 percent was well below the 1987 rate of approximately 97 percent. Domestic production has increased since 1995, bringing some idled capacity back on-line, and domestic smelters are now operating at about 90 percent of rated or engineered capacity (USGS, 2000). These conditions make it likely that any capacity increases will involve using existing capacity or expansions at existing facilities, rather than construction of new greenfield facilities (Plunkert, 2000). No new primary smelters have been constructed in the U.S. since 1980 (McGraw-Hill, 1999). According to Standard & Poor's, construction of new minimill capacity is also unlikely given the potential that added capacity would drive down prices in the face of slow growth in the markets for minimill products (S&P, 2000). EPA therefore assumed that all projected growth in primary aluminum shipments (SIC 3334) will result from using the currently-idled capacity or from expansions at existing facilities.

In the absence of specific information for SIC codes 3339 and 3357, EPA assumed that half of the growth in shipments would result from new facilities, rather than from idled capacity or expansions at existing facilities.

Table 5-10 shows that 11 new facilities could be constructed over the next ten years with one new in scope Aluminum Sheet, Plate and Foil facilities (SIC 3353).

Table 5-10: Projected Number of New Aluminum and Other Nonferrous Metal Facilities (SIC 333,335)

SIC	Number of Existing Facilities ¹		Projected Industry Growth			Estimated Number of New Facilities	
	Total Screener Facilities (1998)	With CWIS, NPDES Permit, Flow > 2 MGD, and 25% for Cooling	Annual	Over 10 Years ²	Share of Growth from New Facilities	Total ³	In Scope ⁴
3334	30.7	10.5	3.0%	34.4%	0.0%	0	0
3339	5.2	1.1	2.5%	28.0%	50.0%	1	0
3353	56.9	6.2	3.0%	34.4%	50.0%	10	1
Total	93	18				11	1

¹ From screener survey results.

² Total percentage growth over 10 years, based on the forecasted annual growth rate $[(1 + \text{annual rate})^{10} - 1]$.

³ Equal to total number of screener facilities * $(1 + 10\text{-year growth rate})$ * share of growth from new facilities.

⁴ Equal to estimated total number of new facilities * ratio of number of screener facilities with CWIS, NPDES permit, flow > 2 MGD, and at least 25% use for cooling to the total number of screener facilities.

Source: §316(b) Industry Screener Questionnaire and various industry sources.

5.2.3 Uncertainties and Limitations

There are substantial uncertainties in EPA's projections of the number of new manufacturing facilities that will be subject to the proposed §316(b) New Facility Rule. While 3-to-5 year forecasts of industry shipments are available for most of the relevant industries, forecasts of the likely growth in capacity and numbers of new facilities are less readily available and those that are available generally apply only for the next few years.

To account for the 20-year time frame of this analysis, EPA assumed that the projected growth for the next three to five years will continue over the next 20 years. This assumption increases the uncertainty about the projected number of new facilities. In addition, it is often not clear how much of any new growth in capacity will result from expansions at

existing facilities as opposed to construction of new greenfield facilities. EPA relied on general information about trends in each industry for assumptions about the relationship between growth in shipments and growth in domestic capacity, and about the portion of new capacity that will be in new greenfield facilities.

EPA's forecasts assume that the characteristics of new facilities that determine their regulatory status under the proposed rule are the same as those of the screener facilities in the same industries. A variety of factors may lead new facilities to use municipal or ground water instead of a water of the U.S. or to recycle the process water more often than do existing facilities, however. Thus, this assumption may overstate the number of new facilities.

5.3 SUMMARY OF BASELINE PROJECTIONS

EPA estimates that over the next 20 years a total of 875 new greenfield facilities will be built in the industry sectors analyzed for this proposed regulation. Two hundred and five of these new facilities will be steam electric generating

facilities and 670 will be manufacturing facilities. As Table 5-11 shows, only 98 of the 875 new facilities are projected to be in scope of the proposed §316(b) New Facility Rule, including 40 electric generators, 48 chemical facilities, and 10 primary metals facilities. No new in scope pulp and paper or petroleum facilities are projected over the next 20 years.

Table 5-11: Projected Number of In Scope Facilities (2001 to 2020)			
SIC	SIC Description	Projected Number of New Facilities Over 20 Years	
		Total	With Costs
Electric Generators			
SIC 49	Electric Generators	205	40
Manufacturing Facilities [†]			
SIC 26	Paper and Allied Products	0	0
SIC 28	Chemicals and Allied Products	570	48
SIC 29	Petroleum Refining And Related Industries	2	0
SIC 33	Primary Metals Industries		
SIC 331	Blast Furnaces and Basic Steel Products	77	8
SIC 333 SIC 335	Primary Aluminum, Aluminum Rolling, and Drawing and Other Nonferrous Metals	21	2
Total Manufacturing		670	58
Total		875	98

[†] The number of new manufacturing presented in this table is *twice* the 10-year forecast presented in Section 5.2.

Source: EPA Analysis, 2000.

REFERENCES

- Jensen, Carl. 2000. Miller Freeman. Phone conversation with Nancy Hammett, Abt Associates Inc., April 11.
- Kline & Company, Inc. 1999. *Guide to the U.S. Chemical Industry*, 6th edition.
- McGraw-Hill and U.S. Department of Commerce, International Trade Administration. 1999. *U.S. Industry & Trade Outlook*.
- Metal Center News Online. 2000. "The Struggle to Compete", <http://www.metalcenternews.com/metaldistribution/mdmill.htm>
- Plunkert, Patricia. 2000. USGS Minerals Information Commodity Specialist for Aluminum. Phone conversation with Nancy Hammett, Abt Associates Inc., April 11.
- pponline.com. 1999. "U.S. pulp, paper, board capacity growth 'ultra slow'." http://www.pponline.com/db_area/archive/pponews/1999/wk12_06_1999/38.htm. December 9.
- Resource Data International (RDI). 2000. NEWGen Database. January 2000.
- Standard & Poor's (S&P). 2000. *Industry Surveys – Chemicals: Basic*. January 6, 2000.
- Standard & Poor's (S&P). 1999. *Industry Surveys – Paper and Forest Products*. October 21, 1999.
- Stanley, Gary. 2000. U.S. Department of Commerce, International Trade Administration, Forest Products Service. Phone Conversation with Nancy Hammett, Abt Associates Inc., April 11.
- Swift, T. Kevin. 1999. "Mid-Year Review of the US Economy and the Chemical Industry." *Economic News and Information*. June 1999. [Chemical Manufacturers Association]
- U.S. Department of Energy (U.S. DOE). 2000. Energy Information Administration. *Assumptions to the Annual Energy Outlook 2000 (AEO2000) With Projections to 2020*. DOE/EIA-0554(2000). January 2000.
- U.S. Department of Energy (U.S. DOE). 1999a. Energy Information Administration. "Market Trends – Oil & Natural Gas." *Annual Energy Outlook 2000*. Report#DOE/EIA-0383(2000). December 19.
- U.S. Department of Energy (U.S. DOE). 1999b. *Supporting Analysis for the Comprehensive Electricity Competition Act*. Document number DOE/PO-0059. Office of Economic, Electricity, and Natural Gas Analysis, Office of Policy, U.S. Department of Energy, Washington, DC 20585.